

INSTREAM PROJECT DESIGN CHECKLIST

*For Design and Construction of Flood and Erosion Protection
Facilities and Habitat Restoration Projects that May Include
Large Wood Placement or Natural Wood Recruitment*

Project Name: Cedar Rapids ELJ 6 Maintenance Repair

Project Manager: Jay Smith

River/River Mile/Bank: Cedar River / RM 7.45 / Right Bank

Date July 19, 2017

Check one or both:

- ☒ Project includes placement of large wood elements (as part of the maintenance repair of an existing erosion protection facility)
- ☐ Project may influence the recruitment, mobility and accumulation of natural large wood.

Note: If the project is comprised of emergency work, then fill out and file this form within 30 days of completion of emergency work.

I. Project Background and Preliminary Design (30-40 Percent) Information

(Provide general information at a conceptual level)

- 1. Describe the overall river management context, strategy and objectives for the river reach. Refer to pertinent plans, policies or documents pertaining to flood hazards, salmon recovery, etc.**

Engineered Log Jam 6 (ELJ 6) is located on the right bank of the Cedar River near River Mile (RM) 7.45. This ELJ was constructed in 2010 as part of the Cedar Rapids Levee Setback Repair Project. The ELJ is located in the reach of the Cedar River that is referred to as the Cedar Rapids Reach.

In October of 2008, the King County Water and Land Resources Division constructed a levee setback and habitat enhancement project in the Cedar Rapids Reach, between RM 7.2 and RM 7.6. This project is referred to as the Cedar Rapids Levee Setback and Floodplain Restoration Project. It included removal of a riprap levee on the right bank and a riprap revetment on the left bank, and installation of setback levees and large wood features to provide habitat enhancements and localized improvements to flood storage and conveyance. Constructing setback levees near the property boundaries on both sides of the river channel greatly improved river connectivity to 35 acres of floodplain and transformed the previously confined and constrained reach by reestablishing the potential for dynamic channel processes and lateral channel migration.

High flows during two large winter storms that occurred within weeks of project completion dislodged a significant number of the large wood habitat features, and caused several of them to float downstream of the project site (subsequently all placed log structures within the reach were removed). In addition, these floods initiated rapid downstream migration of two channel meanders within the project site.

Following these events, Herrera Environmental Consultants were hired to design Engineered Log Jams (ELJs) at the site, while incorporating the removed logs and meeting multiple other objectives (Herrera 2011). This latter project, the Cedar Rapids Levee Setback Repair project, was constructed in 2010 and included construction of 12 ELJs in the floodplain (see Figure 1). At the time of construction, all 12 of the ELJs were installed in locations approximately 20 to 50 feet landward of the active channel (i.e., they were buried in the floodplain). Since 2010, (approximately 6 years) the river migrated approximately 50 to 100 feet northward in the vicinity of ELJs 6, 7, and 9, resulting in main channel flow currently engaging a portion of all three of those ELJs. This eventual engagement of the originally buried ELJs with the river was anticipated and necessary to meet the objective of the original 2008 project, and the subsequent 2010 repair, of improving habitat for Endangered Species Act (ESA) listed salmonid species.

Based on a field investigation in May 2016 by King County River and Floodplain Management (RFMS) staff, ELJ 6 appeared to have lost some of the light loose riprap and most of the alluvium backfill over a portion of the ELJ and therefore currently poses a potential safety hazard to pedestrians and river users. Currently, a portion of the ELJ is now completely porous, thus posing entrainment hazards to recreational users of the river.

In April of 2017, King County staff conducted an assessment of ELJ6 and developed several options to address the safety hazards posed by the ELJ. A 100% level construction plan set of the recommended option was developed to a sufficient level of detail to for King County Construction Crews to complete the maintenance repair. Answers to the following questions in this section are based on the 100% level construction plan set.

- 2. Describe the goals and objectives of the project and its relative importance to the success of DNRP program goals and mandates. Identify funding source(s) and describe any applicable requirements or constraints.**

The original project goals when the ELJs were constructed in 2010 were as follows:

- *Install stable large wood habitat features at the Cedar Rapids site*
- *Ensure that the large wood installations address recreational safety considerations*
- *Discourage migration of the mainstem channel of the Cedar River to minimize the likelihood of impingement directly against the setback levee*
- *Support the original 2008 setback levee project goals and objectives:*
 - *Not increasing flood and erosion risks to homes and infrastructure*
 - *Reconnecting and restoring natural floodplain function and processes*
 - *Improving fish and wildlife habitat and contributing to the recovery of species listed under the federal Endangered Species Act.*

The goals and objectives of this maintenance repair project are as follows:

- *Reconstruct the ELJ to the 2012 as-constructed condition*
- *To the extent possible, include features that will further address recreational safety hazards, such as including bumper logs on the upstream face of the ELJ.*

- 3. Describe the existing (and historic, if relevant) site and reach conditions, including structural features, channel form, and the presence of naturally-deposited large wood. Describe known utilization by salmonids and any important or unique biological or ecological attributes.**

As described under Question #1, the Cedar Rapids reach was historically confined by training levees and revetments along both banks of the river, which allowed for little opportunity for natural channel processes that promote diverse habitat conditions. These levees and revetments locked the channel into a fixed alignment, so therefore there was little in the way of channel migration. The confined nature of the channel in this reach also did not allow for natural accumulation of large wood.

The removal of the existing levees and revetments and the construction of the setback facilities in 2008 promoted channel migration, including the downstream migration of channel meanders. Furthermore, in January 2011, a large magnitude, long duration flood event caused the river to avulse through a high flow relic channel, located between two of the ELJ structures built during the previous summer. One of these two ELJ structures was ELJ6.

Since 2008, large wood accumulation in the reach has increased, due to two factors: (1) the natural processes of channel migration and the resulting bank erosion result in trees in the floodplain falling into the river and (2) the river has evolved into a more complex planform that includes slower water areas and backwater areas that allow for wood transported from upstream of the reach to accumulate. For example, immediately downstream of ELJ6, several distinct natural wood jams have formed in the leeward shadow of ELJ 6.

The 21-mile segment of the lower Cedar River downstream from the Landsburg Diversion is used for spawning and rearing by salmonids, including Chinook salmon (WRIA 8 2005). Beginning in 2003, the City of Seattle's new fish passage facility at Landsburg Dam allowed anadromous salmonids other than sockeye salmon to access over 20 river miles of habitat that had been inaccessible for over a century (Burton, Craig and Lantz 2014). The following other salmonids use the mainstem river through the project site for spawning and rearing: coho salmon, sockeye salmon, rainbow trout/steelhead, and coastal cutthroat trout. Bull trout have also been documented to use the Cedar River for foraging and migration, but there is no known resident population. Three species— Chinook salmon, steelhead, and bull trout— are all protected as threatened species under the Endangered Species Act.

- 4. Describe what is known about adjacent land uses and the type, frequency, and seasonality of recreational uses in the project area. Are there nearby trail corridors, schools or parks? What is the source(s) of your information?**

Land adjacent to ELJ6 and nearly all land within the Cedar Rapids Reach is owned by King County (either King County Roads, King County Parks, or King County Water and Land Resource Division). The Ricardi Reach Natural Area is

located on the opposite bank (left bank) and the Cavanaugh Pond Natural Area is located approximately ½ mile downstream. The Cedar River Trail runs along the left bank of the entire Lower Cedar River.

A recreation study was conducted on the Cedar River by King County in 2010 (Biedenweg and Akyuz, 2011), based on observations and data collection made between May and September in 2010. Based on this study, the highest amount of recreational boater use on the Cedar River was found in the reach between RM 1.1 and RM 7.3, which is immediately downstream of the project site. The project site is located in a reach that sees the second highest amount of recreational boater use, between RM 7.3 and RM 9.4. The project site is also located between two of the most used put-in locations, Cavanaugh Pond downstream and near the Union 76 Station on Maple Valley Highway upstream. During the 2010 observation period, over 2,000 floaters were observed to pass through the reach between the Union 76 Station on Maple Valley Highway and Carco Park in Renton, with almost 400 on the busiest day. The vast majority (84%) of vessels were inner tubes or inflatable mattresses and 12% were inflatable rafts. Recreation use was highly correlated with temperature, with a dramatic increase in use observed when temperature exceeded 80°F. The full report may be found here <http://www.kingcounty.gov/depts/dnrp/wlr/sections-programs/river-floodplain-section/documents/cedar-recreation-study.aspx>

5. **If the project includes wood placement, describe the conceptual design of large wood elements of the project, including, if known at this stage in the design, the amount, size, location, orientation, elevation, anchoring techniques, and type of interaction with the river and stream at a range of flows.**

For the most part, the maintenance repair actions do not include placement of large wood. The repair is mostly focused on replacing the light loose ballast material that was lost from within the ELJ matrix subsequent to the 2010 construction. However, as seen in the 100% plan set, it is proposed that several large wood pieces be lashed to the upstream face of the ELJ to function as bumper logs. Bumper logs were not included in the original design of the ELJ. However, they are proposed as part of this maintenance repair as an outcome of discussions with representatives from the River Safety Council.

The specific details of the large wood elements of the project are summarized as follows (see also the construction plan set):

- **Amount/Location** – A total of four (4) bumper logs will be placed along the upstream face of the ELJ. Four additional logs (stopper logs) will be placed within the matrix of the ELJ to provide support for the bumper logs and to counteract the buoyancy forces from the bumper logs. The stopper logs are intended to hold the bumper logs at a determined elevation.
 - **Size** – The bumper logs will be 24" diameter at the smallest cut end and 30" diameter at the largest cut end. The stopper logs will be 18"-24" minimum diameter at the smallest cut end and 24"-30" maximum diameter at the largest cut end. None of the logs will have attached root wads.
 - **Orientation** – The bumper logs will be constructed in a parallel orientation to the upstream face of the ELJ.
 - **Elevation** – The top elevation of the bumper logs will be approximately one foot above the upper end of the recreational design flow range (i.e. 1,200 cfs). The bottom elevation will be approximately one foot below the lower end of the recreational design flow range (i.e. 150 cfs).
 - **Anchoring Techniques** – The bottom two bumper logs will be lashed to the existing piles using 1/2 " diameter long link deck chain. The upper two bumper logs will be lashed to the stopper logs using ½" diameter long link deck chain. The upper and lower bumper logs will then be attached to one another using 1" diameter all thread pins 36" on center.
 - **Type of Interaction at a Range of Flows** - Under low flows, the river current is roughly parallel to the bumper logs and the upstream face of the ELJ under existing conditions. Under higher flows, the river current can be more direct to the upstream face of the ELJ.
6. **If the project includes wood placement, what is the intended structural, ecological or hydraulic function of the placed wood? What role does the placed wood have in meeting the project's goals and objectives? Is the project intended to recruit or trap additional large wood that may be floating in the river?**

The proposed large wood provides neither a structural nor an ecologic function, but does provide a hydraulic function. The bumper logs will function to reduce the risks to recreational boaters posed by the fact that the ELJ is currently engaged with the river in such a manner that flows sweep along the upstream face of the ELJ. The bumper logs will function as a relatively smooth and continuous facing on the ELJ that will prevent recreational users from being entangled within the ELJ. The placed wood meets the repair projects objectives of reducing risks to recreational boaters. Due to the current river alignment, the existing ELJ does allow for accumulation of wood along the upstream face of the ELJ. The bumper logs, however, are not designed to increase this potential.

7. **Is the project likely to affect the recruitment, mobility or accumulation of natural large wood, e.g., by encouraging wood deposition on or near the site or promoting bank erosion that may cause tree toppling? Describe expected site evolution and its potential effects on natural wood dynamics.**

The maintenance repair project, including the addition of bumper logs to the existing ELJ, will have little to no effect on how natural wood is accumulated on the ELJ. Furthermore, these maintenance repair actions will result in little to no change in how natural wood is deposited or accumulated upstream and downstream of the ELJ.

Under current conditions the existing ELJ does allow for accumulation of wood along the upstream face of the ELJ. The bumper logs, however, are not designed to increase this potential.

Under current conditions, the fact that the ELJ is now engaged with the river is creating a local hard point on the right bank, holding in place a very sharp meander bend. A large gravel bar has formed on the inside of this meander bend, where natural wood has been observed to deposit. Additionally, immediately downstream of the ELJ, a larger gravel bar is currently developing along the right side of the channel after the river takes a turn around the ELJ. Natural large wood is accumulating on and along the fringes of this gravel bar. The proposed maintenance repair project will have little to no effect on altering these natural processes as it is the ELJ itself which is contributing to these processes.

8. **Describe how public safety considerations have been incorporated into the preliminary project design. For placed wood, address each of the considerations:**


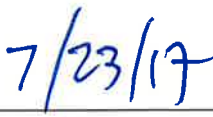
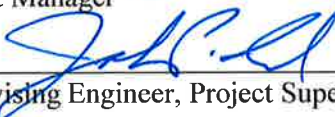

- a. **Type, frequency, and seasonality of recreational use:** *As described in response to Question #4, the project site is located in the 2.1 mile long reach with the second highest recreational use on the Cedar River, second only to the reach immediately downstream of the project site (Biedenweg and Akyuz, 2011). Recreation use in the vicinity of the project is therefore relatively high in the context of the Cedar River. Based on conversations with representatives from the River Safety Council, bumper logs were included in the maintenance repair to prevent recreational users from being entangled within the ELJ.*
- b. **Wood location, positioning, and anchoring techniques:** *As described in the response to Question #5, the bottom bumper logs will be lashed to the existing ELJ using 1/2 " diameter long link deck chain. Stopper logs will also be added to the ELJ to counteract the buoyancy forces from the bumper logs and to hold the bumper logs at a determined elevation. The top bumper logs will be lashed to the stopper logs using 1/2 " diameter long link deck chain. The top and bottom bumper logs will be attached to one another using 1 " diameter all thread pins 36" on center. With this design, the bumper logs will not move with fluctuating flows.*
- c. **Maximizing achievement of project goals and objectives while minimizing potential public safety risks:** *The bumper logs were added to the maintenance repair to explicitly address the potential safety risks posed by the current conditions at the ELJ, which was one of the project goals (see response to Question #2).*
- d. **Use of established and recognized engineering, geological, and ecological expertise:** *The project team included an County engineer with more than 20 years of experience in river and water resource projects, an experienced County Ecologist, and an engineering consultant team. The lead engineer for the engineering consultant team was the engineer-of-record for the design of the original ELJ.*

9. **Has the project been reviewed and approved by a Licensed Professional Civil Engineer? Please list other licensed technical staff who have reviewed and provided input on the design (e.g., Licensed Geologist and Licensed Engineering Geologist). Specify the Engineer of Record for the design and any other Licensed Professionals who have sealed their portion of the design plans. Were all reviews and approvals completed?**

The project design was completed by Herrera Environmental Consultants, the same firm who designed the ELJs that were constructed in 2010. On this team a licensed Professional Engineer developed the design and the design was reviewed by another licensed Professional Engineer. The County Engineer, also a licensed Professional Engineer, reviewed the design. On the 100% construction plan set, the signing PE is Gus Kays, who is also the engineer-of-record.

10. **Has the project been reviewed and approved by a King County Professional Ecologist (e.g., person with an advanced degree in aquatic and/or biological sciences from an accredited university or equivalent level of experience) if ecological benefits are an intended project objective, to evaluate the consistency of the design with project goals, existing environmental policies and regulations, and expected or known permit conditions? Specify the Reviewing Ecologist for the project. Was this review and approval completed? What is the anticipated schedule for completing project milestones (30-40% design, final design, major construction/earthmoving) and for soliciting public input)?**

The County's project ecologist, Kate Akyuz reviewed and approved the project design and provided input on the development of the fish exclusion, willow harvesting and willow installation notes on the design plans. The project is expected to be constructed in mid-August 2017.

	
Project Manager	Date
	
Supervising Engineer, Project Supervisor or Unit Manager	Date

II. Pre-Construction Information (70% or 100% design with permits) *These questions relate to the designed and permitted project. Information should include input resulting from permit review process, SEPA, boater safety meetings and any other stakeholders.*

11. Have any answers provided in Section I at the Preliminary Design Phase changed in the interim? If so, provide the new answers and the rationale for the change.

No, none of the answers provided in Section I have changed. This is partly due to the fact that the answers to the questions in Section I were already based on the 100% construction plan set. Due to the simplicity of the repair, intermediate level (i.e. 30%) plans were not developed.

12. What regulatory review or permits are required for the project (e.g. HPA, Clearing and Grading permit, COE permits)? List any conditions or requirements included in the permit approvals relevant to placement of large wood in the project.

No Federal permits were required for this maintenance repair project. The regulatory branch of the Seattle District USACE determined that this project qualified for exemption from the USACE Section 404 permit. The exemption was granted due to the fact that this was considered maintenance of an existing structure and the maintenance actions proposed did not include any modification that changed the character, scope, or size of the original fill design.

The only state permit that was required was a Hydraulic Project Approval (HPA) permit. The project is covered by a programmatic SEPA for Flood Protection Facility Maintenance. An NPDES permit was not required since there will be less than 1 acre of disturbed area. The provisions specified in the HPA that are relevant to the placement of large wood include the following:

- *Retain all natural habitat features on the bed or banks including large woody material and boulders. These natural habitat features may be moved during construction but they must be placed near the pre-project location before leaving the job site.*
- *Place large wood or other materials consistent with natural stream processes as shown in the approved plans.*
- *Install the anchor piles, large woody materials, and the biotechnical bank protection technique to withstand the 100-year peak flow.*
- *Use fir, cedar, or other coniferous species to construct the large woody material habitat structures.*

Local permits required for the project included a Shorelines Exemption permit and a Flood Hazard Certification Permit. The project was granted a Clearing and Grading permit exemption based on the fact that it is a maintenance repair of an existing flood protection facility and that the repair is not expanding the structure and is replacing fill material and planting in kind.

13. What specific actions or project elements were employed to address public safety in the final, permit-approved design?

As stated in the responses provided for the questions in Section I, the inclusion of four (4) bumper logs on the front face of the ELJ was done so to address public safety risks specifically in regards to recreational boater safety.

14. Describe how the project team solicited public input on the preliminary design. Describe the input received from the public and how, if appropriate, the project team has responded to this input.

On May 17, 2017, the King County Engineer met at the project site with representatives from the River Safety Council (Mike Grajalva and Diane Troje). At this meeting, King County proposed including bumper logs as part of the ELJ maintenance repair design. The River Safety Council was supportive of the idea. The appropriate range of flow rates to use in the recreational design of the bumper logs was then discussed. Agreement was reached that the 1,200 cfs flow rate would be used as the upper limit in the design of the bumper logs.

On June 7, 2017, the ELJ6 maintenance repair project was presented at the King County sponsored Large Wood Public Meeting on Mercer Island. The one comment pertaining to large wood focused on the historic accumulation of natural wood on the upstream face of the ELJ and how this maintenance repair would address this. The County response was that the objective of this repair is to restore the ELJ to the as-constructed condition. The extent to which natural wood will continue to accumulate on this ELJ in the future will not be changed by this maintenance repair.

15. Describe any additional design modifications or mitigating actions that were or will be taken in response to the public comments.

Besides what was described in response to Question #14, no other design modifications or mitigating actions were necessary.

16. Will further educational or informational materials be made available to the public to heighten awareness of the project (e.g., public meeting, press release, informational website, or temporary or permanent signage posted in the vicinity of the project)? If so, explain.

Currently there is a sign posted on the upstream face of ELJ6 stating "Danger Logjam – Exit River Right". King County will continue to maintain signage, as needed, in this reach of the river to warn of large wood hazards. The upstream line of sight for a river user to ELJ6 is approximately 300 feet. Based on hydraulic model results, the average approach velocity at 1,200 cfs is 5 feet per second, which would give a river user up to one minute to take action, if necessary, upon seeing the sign. At this time, there are no plans to make available any additional educational or information materials regarding this maintenance repair project. During summer recreational season, the flows are significantly lower, reducing the hazard in a corresponding manner. The median monthly flows are 510 cfs, 240 cfs, and 150 cfs for June, July, and August, respectively.

17. If the project is expected to influence the recruitment, mobility or accumulation of natural wood, has a Public Safety Management Plan been completed?

As mentioned in response to Question #7, the maintenance repair project is not expected to influence the recruitment, mobility or accumulation of natural wood on the ELJ itself or within the vicinity of the project relative to the current conditions.



Project Manager

7/23/17

Date



Supervising Engineer, Project Supervisor or Unit Manager

7/24/17

Date

III. Post-Construction Actions or Project Modifications

18. Have any answers provided in Sections I and II at the Preliminary design and Pre-Construction phases changed in the interim? If so, provide the new answers and the rationale for the change.

19. Briefly describe the scope and timing of post-construction monitoring and inspection activities planned for the project as they relate to large wood. If a Public Safety Management Plan or Monitoring Plan has been developed for the project, you may simply reference and attach that document.

20. If post construction monitoring or inspections result in modifications to the project, please describe the action taken and the rationale and consistency with the Public Safety Management Plan, if applicable.

Project Manager

Date

Supervising Engineer, Project Supervisor or Unit Manager

Date

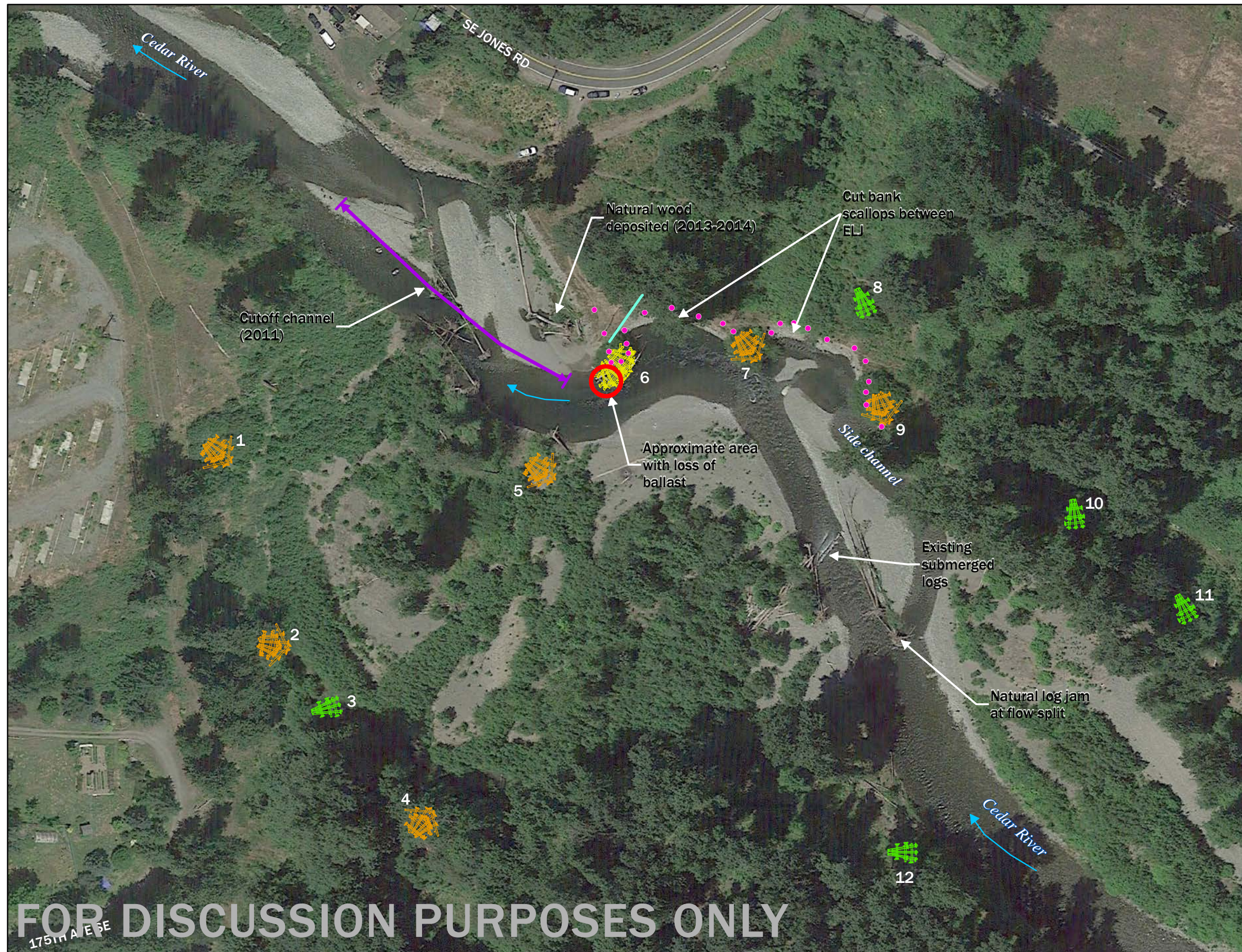






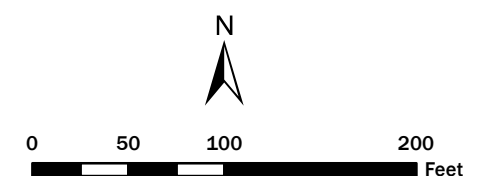


Figure 1.
Cedar Rapids Levee Setback
ELJ Assessment 2017.

Legend

-  Flow direction
- Approximate Existing ELJ Locations
(Constructed 2010)
-  Type 1
-  Type 2
-  Type 3
-  Approximate top bank GPS point
(January 13, 2017)
-  Existing split rail fence



NAD83 WA State Plane North (feet) HARN
Google, Aerial (2016)

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